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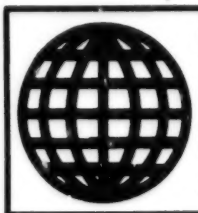

JPRS Report

Science & Technology

Japan

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Japanese Firms Have Difficulty Transfering U.S. CAD Research

95FE0116A Tokyo NIKKEI ELECTRONICS in Japanese
24 Oct 94 p 7

[Article by Masahiro Fujita, VLSI CAD Research Manager, Fujita Laboratories of America, Inc.]

[FBIS Translated Text] Producing Results in United States for Design in Japan Is Difficult

There are many more technicians in the United States than Japan who have earned doctorates and can perform research credibly. Furthermore, the difference in wages between the United States and Japan has shrunk recently because of the sudden rise of the yen. Recruiting staff in the United States results in getting excellent researchers at lower wages. That is why many major Japanese electronics manufacturers establish digital circuit design CAD [computer aided design] research organizations in the United States.

The results of research by laboratories established in the United States by Japanese companies now is evaluated highly even by academic circles. However, announcing research results in academic circles cannot be the only reason why CAD laboratories were set up in the United States. The original goal surely was to develop technology that could be of real use. However, it is not easy to produce results in U.S. research organizations that is of use to users in Japan.

Problems Are the Language Barrier and Slow Reaction

In CAD research, it is most important to accurately define the problem to be solved. To define the problem, information must be received from the users who actually are using CAD and the CAD technicians who are supporting the users. Thus, understanding the user's circumstances, including work procedures and past assets leads to the development of technology that will be of use at the site. The technicians working in the United States certainly know this very well, but it is difficult to collect information about Japan from the United States.

There are two main reasons for this. One is that virtually all of the material from Japan containing the needed information is written in Japanese, and must be translated by someone so that U.S. technicians can read them. This takes time. Even if the material is written in English, it apparently does not convey what the Japanese who wrote in English wanted to say.

Another reason is that even if questions are posed to users and technicians in Japan, responses do not come back. This is due to the fact that in Japan, whenever there is an inquiry from the United States, a conference, including the responsible person, is held to determine how to respond. In the eyes of U.S. researchers, this Japanese way of doing things seems extremely slow.

Physical Meeting with U.S. Researchers Needed

U.S. users and CAD technicians respond quickly to inquiries from researchers. For minor issues, only those directly handling the problem confer and send answers immediately. Furthermore, because the physical distance between them is not great, researchers can meet with users to convey the information.

Under these circumstances, U.S. researchers inevitably associate with U.S. users and CAD technicians, who are closer and respond more quickly than those in Japan, who are farther away geographically and slow to respond. Unless information is conveyed to the United States, research of use to designing in Japan never will be produced by laboratories in the United States, and Japanese companies cannot say that they achieved success by establishing laboratories in the United States.

To make a success of research in the United States, we should not be unwilling to spend the time to provide information. There probably are many users and CAD technicians who are trying to provide the information from Japan by phone or documentation, without even knowing the faces of the U.S. researchers. If possible, they should create an opportunity to meet and talk with the U.S. researchers. Observation of Japanese colleagues shows that they have become quite skillful at providing information after they actually have met with U.S. researchers. They seem to become aware of the importance of conveying information skillfully.

Author's Background

Masahiro Fujita: Born in 1956. Graduated from electrical engineering curriculum, Engineering Department, Tokyo University, in 1980. Earned master's degree from that department in 1982, and doctorate in 1985. Joined Fujitsu Research Institute in 1985, to conduct CAD research. Temporarily transferred to Fujitsu Laboratories of America, Inc., in 1993, as VLSI CAD research manager.

Government Lab Develops High Strength, High Toughness SiN Ceramics

Toughness Record Achieved Through Hierarchical Structure Control

95P60074A Tokyo NIKKAN KOGYO SHIMBUN in Japanese 14 Dec 94 p 6

[FBIS Translated Text] The Agency of Industrial Science and Technology's (AIST) Nagoya-based Government Industrial Research Institute (GIRI) (Director, Yasuhiko Kondo) has developed a high strength, high toughness silicon nitride ceramic. The R&D has been under way as part of the "Synergy Ceramics" Project, which has been upgraded to a National Project since FY94. Ceramic materials have the disadvantage of losing toughness when strength is increased, and vice versa. This adverse trade-off was overcome in the new material through hierarchical structure control. The greatest research accomplishment was achievement of this toughness record with one specimen. The Weibull coefficient, an indicator of reliability, also registered a value as high as that of cast iron. As a result, silicon nitride should be appropriate for a broader range of applications.

Weibull Coefficient Equal to That of Cast Iron

Fine ceramics are known traditionally for their superior strength, heat resistance, and corrosion resistance. But they have the disadvantages of inferior toughness and brittleness. Therefore, research has been on-going to improve their toughness. However, toughness and strength of fine ceramics have an inverse relationship in which one improves at the expense of the other. The "Synergy Ceramics" R&D project was established to simultaneously improve these incompatible characteristics. The new SiN was developed as part of the project.

SiN has raised high expectations for application as a high temperature structural material in products such as engines and gas turbines. High strength SiN developed so far has achieved a strength of 1,200 megapascals and fracture toughness of 7 megapascal/rootmeter. The high toughness SiN developed to date had achieved 700 megapascal in strength and 11 megapascal/rootmeter in fracture toughness. Those superior characteristics are not considered to sum up to a balanced superiority.

The newly developed materials, however, include 2 different types, one with 1,200 megapascal, 12 megapascal/rootmeter and another with 1,400 megapascal, 11 megapascal/rootmeter in strength and toughness respectively. Each type is equally superior in both strength and toughness, achieving the highest rating in both strength and fracture toughness.

The new material was fabricated through a process in which first seed crystals (2 percent) of 4 microns in length and 1 micron in diameter each, binder, and organic solvent were mixed with starter powders. This was next made into thin sheets of about 100 microns in thickness each using the sheet molding method. Then 60 to 100 sheets were layered to create a clad sheet, and finally the product was sintered at 1,850°C for solidification. The breakthrough came by arraying the seed crystals flat and in the same direction during the sheet forming process and controlling growth of the seed crystals during the sintering process.

Columnar particles grown out of the seed crystals were even in the size and shape and dispersed homogeneously.

The researchers concluded that superior mechanical properties were achieved by creating a structure in which particle shape and direction were well controlled.

The Weibull coefficient indicated 50, far surpassing 20, the highest reading for high strength material so far recorded, reaching a value equal to that of cast iron.

This is GIRI at Nagoya's second achievement under the "Synergy Ceramics" project, following a success in alumina research.

Third H2 Launch To Be Delayed

95P60071A Tokyo MAINICHI SHIMBUN in Japanese 27 Dec 94 p 1

[Text] The National Space Development Agency (NASDA) announced on 27 December that the 3rd H2 rocket launch scheduled for 1 February 1995 at Tanegashima Space Center, Kagoshima Prefecture will be postponed.

NASDA found a crack in the gas jet pipe which controls the attitude in space of the reusable observation satellite space flyer unit (SFU or Free Flyer) on board the H2. The delay is expected to last at least 1 week.

JDA To Develop Unmanned Jet Plane

To Be Loaded on Fighter Planes

95P60071B Tokyo NIKKEI SANGYO SHIMBUN in Japanese 20 Dec 94 p 12

[Text] The Japan Defense Agency (JDA) and Fuji Heavy Industries Ltd. (FHI) in FY95 will start developing a prototype multi-purpose unmanned jet plane that can be loaded on aircraft. The unmanned jet can be released from its carrier aircraft in mid-air, and after flying several hundred kilometers, including reconnaissance flights, it can descend for retrieval in a designated place. In addition to remote control of the jet plane via radiowaves, it can fly on its own if programmed in advance. Achievement of practical application of this plane will both relieve pilots of dangerous assignments and help conserve troop strength.

The small unmanned jet flies for several hundred kilometers at about Mach 0.9, patrolling enemy territory over water or land. The jet is capable of real-time transmission of pictures taken with equipment such as infrared cameras providing immediate information on enemy positions. With different equipment aboard, it can play many other roles, including radio interception. Remote control from the ground is possible. But the jet can fly independently if its flight path has been programmed in advance.

The jet is expected to be 6 meters long overall and about 4 meters wide. Its wings can be folded in, and 2 units can be attached to a fighter airplane. Stealth characteristics also will be added which will make it harder to detect with radar. As soon as the plane completes its mission, it returns to earth by parachute where it can be recovered.

Unmanned reconnaissance propeller aircraft already have been developed by the U.S. and Israel and were reportedly used during the Gulf War. Unmanned jet engine aircraft are in the research phase even in the U.S., but they have yet to be deployed during an actual war. The JDA has included about ¥700 million for research on the project in its FY95 budget proposal, hoping to produce a prototype in four to five years.

FHI has been producing unmanned jet engine target aircraft under U.S. license since 1970. They also have completed development of an unmanned reconnaissance helicopter which is ready for operation. They have ample experience in the development of remote control and autonomous flight control technology. They have been conducting in-house research on small unmanned jet planes for a while. Once the program officially starts, FHI will support JDA as the prime contractor.

Aerospace Chief Warns of Defense Cuts

Suggests Industry to Look Out for Themselves

95P60071C Tokyo NIKKEI SANGYO SHIMBUN in Japanese 20 Dec 94 p 12

[Text] Kentaro Aikawa (President of Mitsubishi Heavy Industries Ltd.), president of the Society of Japanese Aerospace Companies Inc. (SJAC), held a press conference at a Tokyo hotel on 19 December. He warned that a cut in the front-line defense equipment budget would have dire consequences for the Japanese aerospace industry. Aikawa pointed out that the industry depends on defense orders for 74 percent of its annual production.

However, the president said that it would not be necessary for the industry to call for an increase in next year's defense budget above the 0.855 percent decided during earlier cabinet talks. Instead, he stressed the need for companies to make efforts to look out for themselves.

Asked about measures that would be necessary if the defense budget were further cut over the long term, Aikawa said that it was a matter for individual combines to decide, and did not disclose any measures endorsed by SJAC. Aikawa still proposed that the Japan Defense Agency (JDA) "prepare as soon as possible the follow-up plan to the Mid-Term Defense Buildup Program (FY91-95), so that the industry can formulate management policies".

Asked about the next generation small jet passenger aircraft (YSX) which Japan plans to develop, Aikawa said, "the development program was originally planned to start in March, but at the moment the details of who is responsible for development costs and sales networks have yet to be decided," indicating that there will be a delay in the program.

Kiku-6 Starts Communication Experiments

Announcement by NASDA

95P60071D Tokyo NIKKEI SANGYO SHIMBUN in Japanese 14 Dec 94 p 5

[Text] The National Space Development Agency (NASDA) on 13 December announced that correction of the "Kiku-6" engineering test satellite's orbit, which had previously failed to reach geostationary orbit, has been completed. They will start communications experiments on 16 December. All equipment on the satellite is functioning smoothly with the exception of a portion of that for space environment observation. Therefore, the program of experiments which was revised in September is expected to be conducted as scheduled.

NASDA fired the attitude control engine 20 times in November, raising Kiku-6's height of perigee by about 720 kilometers. It had been circling in elliptical orbit. As a result, Kiku-6 will be able to avoid the Van Allen belts and the strong radiation present there. At present, the power output of the solar cell is showing 3.4 kilowatts and is expected to remain at 2 kilowatts of output until about January 1996. There should be no difficulty conducting the optical communication experiments which have been scheduled by the Ministry of Posts and Telecommunications' Communications Research Laboratory.

MITI To Operate Pilot Plant to Recycle Glass Products

95FE0078A Tokyo NIHON KOGYO SHIMBUN in Japanese 16 Nov 94 p 3

[FBIS Translated Text] A demonstration plant that will produce aggregate from glass bottle cullet (glass refuse) was completed today and will begin full-scale operations; MITI will operate the plant through the non-profit corporation Clean Japan Center. Sunlight Co., a new enterprise, obtained the development patent license for the plant's technology from Chichibu-Onoda [Cement Co.] and is working to make the plant ready for practical use. ¥1.8 billion was invested in the construction of the plant in Shin-tone Village, Ibaraki Prefecture. The plant will have the capacity for processing 100,000 tons of cullet per year. Aggregate made from cullet is superior to aggregate that is made from obsidian or perlite because it is a great deal stronger and absorbs less water.

The plan is to establish aggregate production from cullet as an industrial technology and thereby help to increase the percentage of glass bottles that are recycled.

In demonstration tests the plant will be used to pulverize cullet, mix the pulverized cullet with clay powder, limestone powder, and sodium silicate, and then pelletize, dry, and bake the mixture to produce a high-strength, ultra-light-weight aggregate. The plans are to continue the experiments until March 1996.

Sunlight Co., the main licensee, was established in February 1992 with joint contributions from Chichibu-Onoda, beverage and food producers such as Kirin Beer and Suntory, glass bottle salvage companies, and cullet producers. The business objectives are to produce and sell synthetic ultra-light-weight aggregate that is made primarily from cullet.

Although the percentage of empty bottles that are salvaged has risen to 56% with the increased public awareness about recycling, there is a limit to the conversion of salvaged bottles into raw materials, and a considerable amount of the salvaged glass ends up in landfills without being re-used.

The demonstration plant that begins full-scale operations today will utilize Chichibu-Onoda's patented technology to recycle discarded glass into ultra-light-weight beads. In addition to facilitating the conversion of refuse back into resources, the plant will provide a new structural material for building construction. As a light-weight aggregate the material is three to five times stronger (190 kg/cm^2) than aggregate made of natural materials such as obsidian, and it absorbs little water (3.6%). For those reasons new uses of the material, such as in light-weight tiles and curtain walls for buildings, are anticipated.

EA Announces Global Environmental Research Plan for FY94

95FE0078B Tokyo NIHON KOGYO SHIMBUN in Japanese 15 Nov 94 p 3

[FBIS Translated Text] On 14 November the Environment Agency made public its "FY94 Global Environmental Research Plan," which is based on the General Promotional Expenses for Global Environmental Research. The plan calls for research on a total of 39 themes, including nine new themes this fiscal year. The total amount budgeted, ¥2.3 billion, is about 9.5% more than that last fiscal year.

The plan for this fiscal year is unique in that new projects were set up that will involve joint efforts with research organizations of developing countries (¥57,460,000 budgeted for joint research with developing countries on analysis models for measures against warming in the Asia-Pacific region). In addition, two new research themes, "evaluation of warming feedback in the Siberian tundra" (¥94,070,000 budgeted) and "the comprehensive evaluation of technologies for preventing global warming" (¥117,800,000 budgeted), were added as ¥100-million-budget-scale priority themes to two such themes continued from last fiscal year.

Other new research themes and the budgets for those are as follows:

- evaluation of climatic fluctuations by means of climate models (¥39,950,000);
- development of integrated models of substances such as those that cause acid rain in Eastern Asia, and the development of practical methods of controlling those substances (¥16,840,000);
- elucidation of the mechanisms by which the ecosystems of coral reefs are maintained, and the preservation of coral reef ecosystems (¥25,350,000);
- the creation of ground cover distribution maps of Southeast Asia using satellite data (¥14,270,000);
- basic research on the correlation between population growth in developing countries and global environmental problems (¥15,430,000);
- how cities and lifestyles should be in order to reduce environmental impact (¥18,560,000).

Chubu Electric Power Co. Develops Technology to Treat Aluminum Waste Using Plasma

95FE0078C Tokyo NIKKAN KOGYO SHIMBUN in Japanese 4 Nov 94 p 4

[FBIS Translated Text] [NAGOYA]—Chubu Electric Power Co. (H. Abe, president) developed technology that uses plasma processing to render harmless a residue called "alumidros" that is generated in aluminum recovery processes, and to reduce the content of the residue by about 40%. Heating the alumidros to a temperature of 10,000°C or higher with a plasma and then solidifying it into ceramic form makes the chlorine, lead and other harmful substances within it completely insoluble. The practical application of this technology is anticipated because it can be used to convert alumidros, which is now a waste product, into materials for roadbeds and other uses.

Alumidros is a residue that is produced when aluminum is melted down for re-use. 94% of the scrap aluminum is regenerated but the other 6% is left over in the form of alumidros, which contains substances such as aluminum, lead, cadmium, nitrogen, and chlorine. Now, alumidros is processed and buried in landfills, but chlorine and ammonia dissolve out of it and can cause nasty odors.

The technology developed by Chubu Electric uses a plasma to melt the alumidros, and then solidifies it. The alumidros

is put into a carbon crucible and heated by a plasma to about 10,000°C, which melts it. In five minutes 200 g of alumidros can be processed with 20 kW of power.

The plasma processing reduces the concentrations of harmful substances such as chlorine, lead, nitrogen, and cadmium contained within the alumidros. In particular, the plasma processing can remove 99.9% of the chlorine.

Because the process completely solidifies other substances that remain in trace amounts, those substances will not dissolve again when the processed alumidros is exposed to rain, for example. In addition, because the alumidros becomes 2.5 times more dense after the plasma processing, its volume can be reduced by about 40%. The processing of alumidros, about 300,000 tons of which is said to be discharged in Japan per year, is an issue of vital importance in the aluminum industry. Actually, a working group set up within the Japan R&D Center for Metals is tackling the issue. If Chubu Electric's technology becomes practical, the processing of alumidros as a waste will be simple. Furthermore, if the strength of the processed alumidros can be guaranteed, it can be used as a material for roadbeds. It looks like the technology will gain a great deal of attention as a way to convert a waste product into a resource.

EA To Develop Underground Water Conservation Technique in FY95

95FE0078D Tokyo NIKKAN KOGYO SHIMBUN in Japanese 7 Nov 94 p 4

[FBIS Translated Text] In FY95 the Environment Agency will begin a qualitative investigation of the causes of underground water pollution attributable to nitrate nitrogen and will set out to establish a comprehensive method of underground water conservation. Concretely, the agency will commission other organizations with tasks such as choosing as case studies areas where there is marked underground water pollution, surveying local public entities to elucidate the mechanisms of the pollution, and forecasting the state of such pollution in the future. The Environment Agency will also gather and organize information about measures taken against underground water in European countries and compile a list of examples of how other countries deal with such pollution. The idea is to use those results to formulate guidelines on measures against underground water pollution in Japan attributable to nitrate nitrogen.

In recent years underground water pollution attributable to nitrate nitrogen has started to become manifest. Some causes of that pollution are the use of fertilizers, the return of livestock waste to farmland, and small-scale sewage processing facilities. For example, there have been many reports of cases where adults' ingestion of food containing nitrate nitrogen resulted in oxygen debt, and examples of the effects of nitrate nitrogen on the health of infants who drink artificial milk.

The current level of nitrate nitrogen pollution in Japan is high. Furthermore, because the nitrogen load due to substances such as fertilizers is expected to continue into the future, the Environment Agency judged nitrate nitrogen pollution to be a problem that can no longer be overlooked and decided to begin investigations into measures for dealing with that pollution.

Unlike underground water pollution attributable to toxic substances such as trichloroethylene, underground water pollution from nitrate nitrogen is caused by a wide range of substances. Nevertheless, hardly any efforts have been made to quantitatively grasp the causes of such pollution, and few if any prevention or recovery measures have been taken. So far, prevention and recovery measures were only pointed out in the items that require monitoring according to a notification issued by the head of the Environment Agency's Water Quality Bureau, and no mention of those was made in the environmental standards in the standards for tap water.

In contrast, measures are being taken in European countries to obviate underground water pollution that results from the use of large amounts of fertilizer. For example, instead of demanding that farmers reduce the amount of fertilizer that they use, some governments are compensating farmers for decreases in crop production due to the use of less fertilizer.

As it conducts detailed surveys of such examples of measures in other countries and adds in the results of case studies in Japan, the Environment Agency will formulate comprehensive guidelines on measures against underground water pollution.

Fujitsu Develops Technology To Clean ICs Using Water

43070008A Tokyo THE NIKKEI WEEKLY in English 14 Nov 94 p 5

[Article with no byline]

[FBIS Transcribed Text] Metal contaminants which lower the performance and endurance of integrated circuits can be removed from the surface of silicon substrates with nothing more than pure water, according to a report from Fujitsu Ltd.

The find is good news for the environment, since hydrochloric acid and sulfuric acid are currently used. And it is also good news for IC makers as the process eliminates worry about proper concentrations and simplifies the cleanup of waste liquids.

In the method, pure water is first treated to reduce the oxygen concentration from 8 parts per million to 1 part per billion, and then heated to the boiling point. The silicon substrate is then immersed in this boiling water for a period of 30 minutes. During the boiling process, care is taken to keep out oxygen from the air.

Fujitsu has confirmed that this treatment reduces by 1,000-fold the presence of nine types of metal contaminants on the surface of a silicon substrate, including aluminum, copper, iron and manganese.

MELCO Develops Sensor System Using Optical Fibers

Elimination of Electromagnetic Radiation

95P60070A Tokyo NIKKEI SANGYO SHIMBUN in Japanese 15 Dec 94 p 1

[Text] Mitsubishi Electric Corporation (MELCO)'s Industrial System Laboratory has developed a sensor system which can accurately assess distribution of radiation in nuclear power stations using "scintillation fibers," optical fibers which illuminate in the presence of radiation. By simply installing the fibers on walls or ceilings of facilities, the sensor system can discover the presence of high or low radiation within a space of 26 centimeters. It will benefit workers' health and improve safety management at nuclear fuel recycling facilities as well as nuclear power plants. It is the first time optical fibers have been used as sensors. Development of other applications will be pursued actively in the future.

Scintillation fibers are fabricated in wire form by combining plastic resin and fluorescent material. They illuminate when gamma rays and X-rays pass through them and transmit optical signals to both ends of the fibers. Detectors at both ends of the wire calculate the difference in time it took the signal to reach it and thereby determine which part of the fiber received the radiation. Strength of the radiation dose also can be measured by calculating the number of photons in the radiation.

Three-dimensional detection of the position and strength of radiation is possible if multiple fibers are installed in a lattice pattern. With the system installed near radiation sources such as reactor containers, data is collected and managed centrally in the control room. During inspections, for example, accidents can be prevented by warning the inspectors not to stay too long in places where a great deal of radiation has been detected.

Conventional radiation sensors employ metal cables to transmit the radiation signals received by the fluorescent substance. This made the signals vulnerable to electromagnetic noise emitted by peripheral electronic equipment. Also, each sensor covered such a small area that many of them had to be installed. Optical scintillation fibers are unaffected by electromagnetic waves and 1 fiber can measure radiation on area of a few dozen meters, thus minimizing installation costs.

MELCO says that this technology can be used for luggage inspection equipment at airports where radiation is used. Scintillation fibers were often used in academic experiments such as high energy physics and element particle research but very rarely used for industrial purposes.

Toshiba Develops Advanced Excimer Laser From NEDO Research

95P60050 Tokyo DENKI SHIMBUN in Japanese 24 Nov 94 p 13

[Summary] Toshiba Corp. has developed a 500 watt (average output) excimer laser that has achieved the "world's highest" repeating frequency of five kilohertz. Furthermore, it is said to have a processing speed nearly 17-times faster than existing equipment. Toshiba plans to market its excimer laser for use in high-speed, ultra-fine processing of semiconductors and for use in the medical and energy fields to produce such things as high quality superconducting thin film.

Toshiba developed the equipment from research sponsored by the New Energy and Industrial Technology Development Organization (NEDO) as a part of the "Research and Development of Advanced Material Processing and Machining Systems," which was one of the Agency for Industrial Science and Technology's (AIST) large-scale projects that began back in 1986 and terminated at the end of last year. Since then, Toshiba has been testing the equipment and looking for commercial applications.

In order to accelerate the pulse discharge, Toshiba has developed a new multistage axle flow-type ventilator within the machine's gas circulation equipment, which helps prevent reverse gas flows. Furthermore, on the discharge portion, Toshiba uses a newly constructed "intermediate electric potential method," which suppresses the electric field in the surrounding area and allows for a stable discharge.

Toshiba also developed a new switch power source. Previous vacuum tube switches, such as thyratron, had to be replaced at regular intervals because of such things as electrode depletion from the discharge. Toshiba now uses a metal oxide semiconductor (MOS) assisted gate triggered thyristor (MAGT). This switch provides the high-speed elements of MOS and is suited for processing high electrical power with its thyristor element. Consequently, this switch can provide high speed and stable operations up to a repeating pulse of 5 kilohertz.

NEC, Toshiba Choose Different Production Strategies

95FE0117A Tokyo NIKKEI MICRODEVICES in Japanese Nov 94 p 75

[FBIS Translated Text]

Next DRAM Production Bases Diverge Based on Overseas Record

It is rapidly becoming clear that the next DRAM (dynamic random-access memory) production bases for NEC and Toshiba will be divided between sites constructed domestically and in the United Kingdom. NEC has decided on the U.K. based on the merits of its existing production lines and their numerous advantages, while Toshiba has settled on domestic production based on the prospect of maintaining its competitive strength even in the face of the climbing yen.

NEC's and Toshiba's plans for factories are as follows (Table 1).

Table 1. Summary of NEC and Toshiba New Plants

NEC has decided on the U.K. based on highly efficient existing lines, while Toshiba is remaining in Japan after determining that it can maintain its competitive strength even with the high yen. The Toshiba column contains some estimates based on this journal.

Company		NEC	Toshiba
Location		Livingston, Scotland	Yokkaichi, Mie Prefecture
Factory name		To be determined	No. 2
Design rule (μmm)		0.35 to 0.25	0.35
Wafer diameter (mm)		200	200
Production capacity		20,000/month	4.5 million/month for 16M DRAM
Items produced		64M, 16M DRAM, microcomputers, ASIC	64M, 16M DRAM
Operating plan	Begin construction	April 1995	First quarter 1995
	Begin operations	October 1996	During 1996
Building site	Plot area (m^2)	360,000 (newly acquired portion)	approximately 310,000 (entire Yokkaichi factory)
	Floor area (m^2)	25,000	50,000
	Structure	One story building	No response
Investment (billions of yen)		80	100

NEC has invested ¥80 billion in Scotland for the construction of a 20,000 wafer/month production line. Construction will begin in April 1995 with operations expected by October 1996. Toshiba is investing approximately 100 billion yen in Yokkaichi, Mie Prefecture to construct a 16M DRAM line that will turn out 4.5 million wafers per month. Construction will begin in the first quarter of 1995, and operations are expected to begin during 1996. In both cases wafer dimensions are 200mm and 0.35 μm. 16M wafers will be produced, with expansion into 64M wafers.

"Efficiency is High in the U.K."

The reason NEC has decided on the U.K. is that its existing factory there is highly efficient, which allows the company to make the most of a number of advantages.

There are costs and returns that indicate the efficiency of the U.K. plant. When comparing 4M DRAM, the yield for the Roseville plant in the United States is higher, but according to NEC Managing Director Sasaki, at the present time "our existing plant in the U.K. has the lowest costs and highest returns of all NEC production lines".

As a result, the following advantages can be maximized by establishing a production base in the U.K.:

- trade frictions with regard to domestic shipments can be avoided;
- the risk of exchange rate fluctuations can be avoided because of the continued drop in the pound;
- the wafers can be produced at a principal base of consumption, by augmenting the existing plant which is operating at full capacity.

In addition, NEC's 256K through 4M lines at its existing plant are becoming outdated, and a U.K. production base can address the problem of trained technicians that are being left behind technologically.

Eighty billion yen is being invested in a 20,000/month capacity line, which is considerable when compared to the ¥95 billion invested in NEC's Kyushu No. 8 line, with a 30,000/month capacity. Although devices imported from Japan and the U.S. are subject to duty, NEC concluded that establishing a U.K. production base was the best policy.

Maintaining Competitive Strength by Reducing Operating Costs

On the other hand, Toshiba will run out of space after its system for increasing production goes into effect at the end of 1995, and the company is under pressure to start construction on a plant for the production increase after 1996. Toshiba decided to construct domestically due to the prospect of profitability even at ¥90 to the dollar.

Operating costs will determine whether or not shipments from a domestic plant will be profitable. Although a concrete plan has not been announced, some issues are being worked out such as reducing the amount of power used and recycling water and chemicals. In addition, more efficient use of facilities is planned by constructing a second building at the Yokkaichi site.

As for an overseas base, "Toshiba does not have an overseas record, and cannot produce overseas now. We will enter into a partnership with a foreign manufacturer when the yen climbs higher and we determine it to be a necessity." (Toshiba Vice-President Egawa).

PNC To Start Actinide Recycling Project

95FE0002A Tokyo NIKKAN KOGYO SHIMBUN in Japanese 5 Sep 94 p 6

[FBIS Translated Text] In FY95 an "actinide recycling" project will start. Actinide recycling is a new method of recycling nuclear fuel by recovering nuclear fuel waste that has a half-life ranging from several millions to several thousands of years and is considered dangerous and then using that recovered waste as fuel for a reactor. The Power Reactor and Nuclear Fuel Development Corporation (PNC; Hiroshi Oishi, director) will promote actinide recycling as a new recycling method that is based on a concept different from that of conventional nuclear fuel recycling. The new method of recycling nuclear fuel will simplify the processing of high-level radioactive waste and will not pass on a nuclear "bill" that will have to be paid by later generations. This large-scale project to use as fuel the actinides recovered from nuclear power plants will also dispel the distrust of other countries towards Japan's storage of plutonium because plutonium, which becomes a problem in nuclear nonproliferation, is recovered and used in a form in which it is mixed with actinide elements.

Safety of New-Element Fuel Confirmed

Actinides are elements such as neptunium-237 (half-life, 2,140,000 years), americium-243 (half-life, 7,380 years), and curium-245 (half-life 8,500 years) that are found in substances such as the spent fuel of a light water reactor (LWR) and the spent fuel of a fast breeder reactor (FBR). The actinide recycling project will involve the development of technology for fuel processing, reprocessing, and an experimental reactor. The PNC has already begun developing the elemental technologies for those and has finished setting up the basic equipment and facilities for the project.

The goals of the project that starts in FY95 are to foster the basic technologies and to expand and finish those in the form of a practical system. Overlapping studies on the reprocessing issues have been carried out. The PNC started promoting the technology project two years ago, in April 1994 started an actinide group at the Tokai Plant, and in July set up the "New Cycle Technology Promotion Committee," which is led by Masahisa Ida.

The PNC confirmed that safety can be ensured, even in combustion experiments using fuel containing up to 5% americium. In the upcoming project the first target will be americium. The PNC is now acquiring americium and developing 1% converted fuel (pellets). The plan is to burn the pellets in the demonstration "Joyo" FBR. Basic data will be gathered in a series of experiments using americium contained in plutonium fuel and experiments using neptunium obtained from the Tokai Plant's reprocessing facility. After that the PNC plans to use the prototype "Monju" FBR to carry out the tests from the pellet stage in which Joyo was used and fuel assembly experiments.

Reducing Automation Costs an Issue

Coming into contact with radiation during the processing is an issue. The nuclear fuel waste cannot be handled in the plants that up until now surrounded a grow box. All processes within the plant must be entirely automated. The development of automation technology and research on cost reduction processes will be important issues.

On the other hand, the new form of reprocessing to recover americium, neptunium, and curium from spent fuel will correspond to advancements in the Purex method of the existing reprocessing technique. Neptunium, which has properties similar to those of plutonium, can be recovered by simply changing the solvent used in the reprocessing.

In addition, an established technology called "TRUE-X" will be used for americium and curium. "TRUE-X," a processing method developed by the Argonnne Laboratory of the United States, uses a special solvent. The problem is that rare earth elements are also recovered when spent fuel is processed by that method. In the actinide recycling project the PNC will try to find a solution to that imperfect technology.

Development of an Experimental MOX Fuel Reactor

The PNC will also tackle the development of "new reprocessing technology," the goal of which is to develop the ultimate reprocessing technology that will be used after 2010. The technology for recovering uranium, plutonium, americium, neptunium, and curium all together will play a pivotal role in actinide recycling and it will also help Japan cope with nuclear nonproliferation because processes for recovering plutonium separately will be completely eliminated.

The PNC will also tackle the development of an experimental fast reactor that will only be used for efficient, continuous burning of fuel containing actinides. The fast reactor, which will use mixed oxide (MOX) fuel into which actinides are mixed, may also serve as a high-level radioactive waste processing measure to cope with the coming age when FBRs are practical.

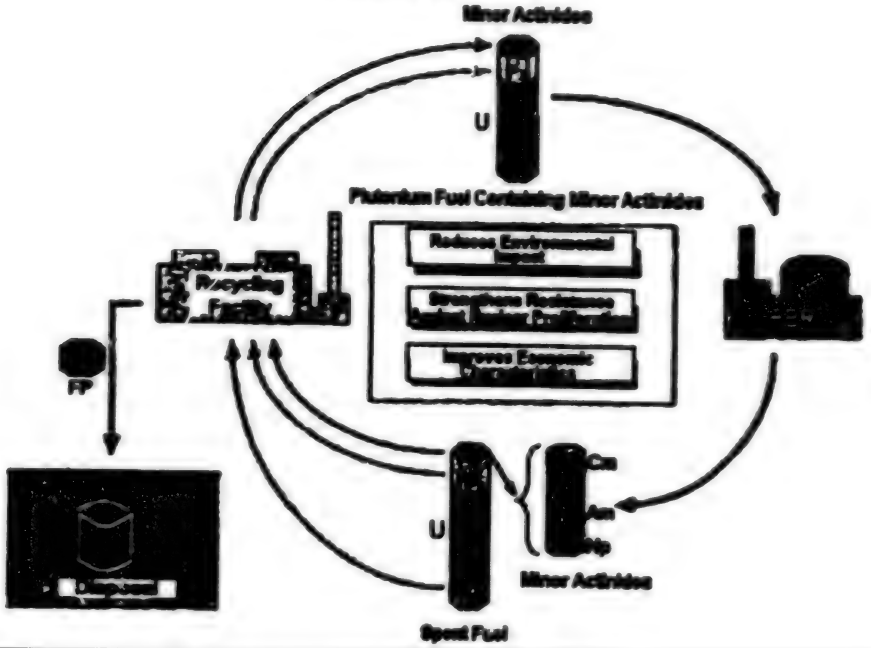
The PNC will request money from the FY95 budget to cover the expenses of the conceptual design of the experimental reactor. The experimental reactor will also be a reactor for demonstrating with an FBR the same sort of "super-safe reactor" concept that is the current goal for LWRs. An actinide recycling reactor and the development of ideal FBR technology are the PNC's objectives.

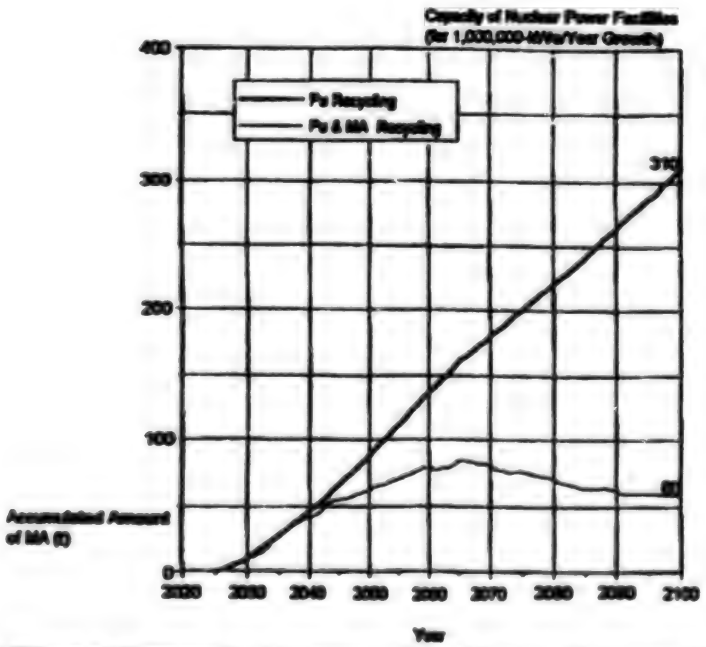
By implementing this project the PNC will keep the 310-350 tons of actinides that will be generated by 2100 in the fuel cycle and will eliminate the discharge of that radiation into the natural world. The PNC predicts that, as a result, 79-81% of the nuclear fuel used in nuclear reactors will be usable as an energy source.

	Growth in nuclear-powered electricity generating facilities	
	1,000,000 kWe/year	1,500,000 kWe/year
Amount of MA produced from 2025-2100 (tons)	About 310 (Np67, Am230, Cm15)	About 390 (Np86, Am284, Cm19)
Amount of MA produced in 2100 when MAs are recycled (tons)	About 60 (38 within reactors, 20 from the fuel cycle, 0.5 from waste)	About 82 (54 within reactors, 28 from the fuel cycle, 0.6 from waste)
Percentage of MA combustion due to recycling (%)	81 (Np88, Am83, Cm24)	79 (Np87, Am80, Cm17)

MA = minor actinides, Pu = plutonium, Np = neptunium, Am = americium, Cm = curium

Actinide Recycling Concept





Trial Calculations of Effects of Suppressing Accumulation of MA Nuclides By Means of MA Recycling (Comparison with years after 2025, when MA recycling will begin)

PNC to Develop Virtual Engineering System Using Monju FBR Data

95FE0002B Tokyo NIKKEI SANGYO SHIMBUN in Japanese 5 Sep 94 p 5

[FBIS Translated Text] The Power Reactor and Nuclear Fuel Development Corp. (PNC) will tackle the development of a virtual engineering system that will provide computerized reproduction of nuclear power facilities. The virtual engineering system will be used to simulate a fast breeder reactor (FBR) based on the design and operations data from the "Monju" FBR (in Tsuruga City, Fukui Prefecture), which reached criticality this April. PNC researchers will also attempt to simulate accidents that are difficult to simulate in an actual reactor. The PNC wants the system to be a new development tool that can be used in the design of new types of reactors after Monju.

A parallel computer at the PNC O-arai Engineering Center (O-arai-machi, Ibaraki Prefecture) will be linked with Monju's circuits for the development of the virtual engineering system, which the PNC aims to complete in about 10 years.

The goal is to provide a computerized reproduction of an entire nuclear reactor in the form of an integrated system based on Monju's core, piping, and other structural design; fuel and other data; and operations data that will be gathered from now on. The virtual engineering system will create a virtual "second Monju."

If that can be realized, the effects an abnormality in any individual system would have on the entire reactor could be understood, and conditions of an actual reactor that cannot be tested, i.e., a core meltdown, could be hypothesized, which would thereby enable engineers to infer the critical values of the design. Data obtained in such a way would be used in the design of even larger-scale commercial reactors.

As for nuclear reactor design aids, some makers are developing practical systems that, for example, display 3-D images of the reactor's structure based on 3-D design data. However, an advanced system providing safety-related simulations that reflect data such as operational results is a future development topic. Applications of such a system in the design of other types of reactors, such as light water reactors, are also possible.

The PNC announced its plan to accept foreign researchers at Monju, which would function as an international center for research on fast reactor development. The idea is to pool data relating to fast reactors outside of Japan and to proceed with the virtual engineering development within an international framework.

STA To Cooperate in Decommissioning Old Nuclear Reactors in Old Communist Block

95FE0002C Tokyo NIHON KEIZAI SHIMBUN in Japanese 21 Sep 94 p 5

[FBIS Translated Text] The Science and Technology Agency (STA) will cooperate in the decommissioning of obsolete nuclear reactors in old Communist-block countries. In the first effort that will start in FY 1995, the STA will help formulate a plan for decommissioning Slovakia's Bovnichie [transliterated] nuclear power plant, which has remained out of operation for about 15 years. This is the first time that Japan will cooperate in nuclear power matters that involve decommissioning old reactors in the former Communist block countries. Until now Japan's nuclear power support was limited to technical guidance in connection with design and operation. However, the neglect of non-operating nuclear power plants is viewed as a big problem from the point of safety management, hence the STA's current offer to cooperate in decommissioning old reactors.

Of the Bovnichie nuclear power plant's five reactors, the A1 reactor (output: 144,000 kW) requires decommissioning. It is a special kind of heavy water gas-cooled reactor that was completed in 1972. Operation of the reactor has been suspended since an accident involving fuel rod damage occurred in 1977.

The Slovakian government saw that repairing and restarting operation of the long neglected nuclear power plant was impossible and asked the STA for help in decommissioning the plant. The STA agreed to the request.

The STA will send researchers from the Japan Atomic Energy Research Institute (JAERI), which has a record of safely dismantling nuclear reactors, to the Bovnichie nuclear power plant. After surveying the degree of damage to the reactor and the state of radiation distribution within the reactor, the STA will formulate the procedures for dismantling the reactor during FY95 and calculate the amount of funding needed, then will present that information to the Slovakian government.

In the aid to Slovakia JAERI will utilize the knowhow (technical information) it accumulated in the dismantling and decommissioning of the Japan Power Test Reactor (JPDR), a long-term project that started in 1981.

At the Napoli Summit this July the heads of state agreed on the early closing of the highly dangerous, obsolete nuclear power plants of the former Communist block countries. The number of nuclear power plants that need to be shut down will certainly increase, and Japan's cooperation in their decommissioning will be a significant contribution to the international community. Since FY 1993 Japan has received five Slovakian nuclear engineers and has provided them with guidance on nuclear power design and operations technology.

Kansai Electric To Replace Pressure Vessel Covers To Prevent Future Incident

95FE0002D Tokyo NIHON KEIZAI SHIMBUN in Japanese 7 Sep 94 p 34

[FBIS Translated Text] On 6 September Kansai Electric Co., announced that it will replace the upper covers on the reactor pressure vessels of the Mihama NPP's No. 3 reactor and the Takahama NPP's No. 1 and No. 2 reactors, all of which are 826,000-kW pressurized water reactors operating in Fukui Prefecture. It will be the first time in Japan that a part of the main body of a reactor's pressure vessel is replaced. The reason for the replacements is that "there have been cases in other countries of cracks occurring in the welded parts of the upper covers of similar pressurized water reactors." Kansai Electric explains that "the replacements are a preventive measure."

The company plans to undertake the replacement work during periodic inspections from December 1995 through June 1997. The cost will be ¥3 billion per reactor.

In the upper cover section, through pipes that pass through the control rods are welded into place, but cracks due to pressure, temperature, or properties of the material may occur in those welded sections. In the worst case, if a crack occurs and expands, that could lead to an incident in which cooling water leaks out of the pressure vessel.

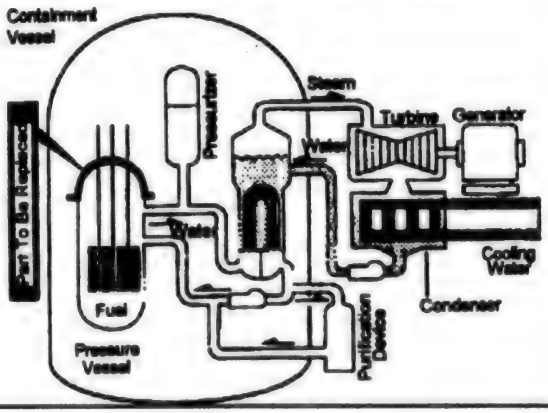
Overseas, a crack in a welded part of the Byujiei [transliterated] NPP's No. 3 reactor was discovered in France in September 1992. Later, when 43 nuclear power plants were investigated in Europe and the United States, similar cracks were found in 23 power plants. Replacement and repair work was then carried out in those plants.

"No Safety Problem," says ANRE

In response to Kansai Electric's announcement of its plan to replace the upper covers of reactor pressure vessels, MITI's Agency of Natural Resources and Energy (ANRE) said, "It is based on the company's independent judgment, and there is no safety problem." In Japan there are 21 of the same type of pressurized water reactors, including the three reactors whose pressure vessel covers will be replaced. "16 of those will undergo periodic spot inspections of the problem areas, and there will be no immediate effects on the other nuclear power plants," said ANRE.

Safety Ensurance a Priority

Layout of Pressurized Water Reactor



Kansai Electric's announcement of its decision to replace the covers of the pressure vessels of its pressurized water reactors was all the more unexpected because there has not been any problem with pressure vessel covers in Japan so far. Nevertheless, it is a decision that puts safety first, and the local residents of Fukui Prefecture took the news calmly. Kansai Electric also decided to replace the old steam generators of the three nuclear reactors, which will result in a great deal of continued repair work.

The three nuclear power plants have been in operation for 18 to 20 years. The lifetime of a nuclear power plant is typically 40 years, and when half of the lifetime is over, deterioration that increases the likelihood of an accident becomes a problem. This issue of replacing the upper covers of reactors' pressure vessels is a move to obviate accidents as much as possible and operate the reactors safely.

Although replacing the upper covers is a huge job, it can be done relatively simply. In a periodic inspection, plant workers pull out fuel and remove the upper cover to inspect the pressure vessel. When the inspection is finished and it is time to put the cover back on, they will replace it with a new cover.

Because the steam generators of the Takahama No. 1 reactor and the Mihama No. 3 reactor will be replaced during the periodic inspections of the reactors, there is no need to extend the work time to replace the upper covers. The Takahama No. 2 reactor's steam generator has already been replaced, so the time for the periodic inspection will be extended two to three months because of the replacement of the upper cover.

Periodical Safety Reviews of Nuclear Power Stations Confirm High Reliability

95FE0002E Tokyo DENKI SHIMBUN in Japanese 1 Sep 94 p 1

[FBIS Translated Text] On 31 August three electric power companies—Tokyo Electric, Kansai Electric, and Japan Atomic Power—submitted to MITI's Agency of Natural Resources and Energy (ANRE) the results of periodic safety reviews (PSRs) conducted on the Fukushima NPP-I No. 1 reactor, the Mihama NPP No. 1 reactor, and the Tsuruga NPP No. 1 reactor. The three plants are the first to be subject to the reviews, which were based on notifications that ANRE sent to the electric power companies in June 1992. The results of 1) comprehensively evaluating operational experience, 2) understanding the state in which the latest technical knowledge is reflected and formulating necessary measures, and 3) conducting probabilistic safety evaluations confirmed that all three plants have a hign level of safety and reliability and that renovations and conversions of facilities have been carried out in an appropriate manner. The plan is to conduct reviews over a 10-year period on all of the 46 nuclear power plants now in operation. Four reactors will be the subjects of the next PSRs: Kansai Electric's Mihama NPP No. 2 reactor, Chugoku Electric's Shimane NPP No. 1 reactor, Tokyo Electric's Fukushima NPP-I No. 2 reactor, and Kyushu Electric's Genkai NPP No. 1 reactor.

Government safety regulations and the independent safety activities of electric power companies ensure the safety of Japan's nuclear power plants. However, due to the current situation in which there are more and more nuclear power plants that have passed through a considerable number of years since the start of operation, the PSRs look at the independent safety activities of electric power companies from the viewpoint of comprehensive preventive safeguards. Aimed at further improvements in safety and reliability, the reviews will involve comprehensively evaluating every 10 years or so existing nuclear power plants based on the latest technical knowledge, and formulating necessary measures.

Three plants that went into operation around 1970 are the subjects of these first PSRs. As for the probabilistic safety

evaluations, the electric power companies submitted reports on accident management studies to ANRE at the end of March. Therefore, the results of the first two review items, i.e., comprehensively evaluating operational experience, and understanding the state in which the latest technical knowledge is reflected and formulating necessary measures, were submitted on 31 August.

With that, ANRE consolidated a variety of data on the plants' operation since initial startup to the present, and information about the state of improvements of facilities and management. The results confirmed that, since the initial start of operations at the nuclear power plants, improvements have been made in the percentage of facilities usage, the percentage of breakdowns occurring, radiation workers' dose equivalents, and the amount of radioactive waste generated, and that safety and reliability are at a high level. In addition, whether or not newly gained technical knowledge is reflected appropriately in facilities for the purpose of improving safety was also evaluated. Those results confirmed that the latest technical knowledge is reflected appropriately in the improvements of facilities and in the method of evaluating nuclear reactor safety, and that has brought about an improvement in safety.

One planned improvement is to increase the reliability of the residual heat removal system of the Fukushima NPP-I No. 1 reactor. Pipes to connect the reactor shutdown cooling system with the containment vessel cooling system will be installed so that the containment vessel's seawater cooling system can also be used for cooling when the reactor is shut down. In addition, the steam generator of the Mihama NPP No. 1 reactor is to be replaced, a plan that resulted from comprehensive consideration of social reliability, maintainability, and economy. Due to a leak in a heat-transfer pipe this February, the replacement work schedule is to be moved up.

Assessing Safety Improvements

On 31 August MITI's Agency of Natural Resources and Energy (ANRE) made public its assessment of the Fukushima NPP-I No. 1 reactor, the Mihama NPP No. 1 reactor, and the Tsuruga NPP No. 1 reactor, based on reports received from three electric power companies in connection with periodic safety reviews directed by the agency. ANRE's assessment is that, for the facilities and equipment that are critical to safety, the electric power companies are making improvements that will raise the level of safety. In addition, ANRE judges that the latest technical knowledge has been independently reflected in the plants, and that the electric power companies are appropriately maintaining and improving the safety of their nuclear power facilities. Today, 1 September, ANRE will report the results of its assessment of the three reactors to the Nuclear Safety Commission.

In the report of the assessment the "Comprehensive Evaluation of Operational Experience" focuses on operations-related area such as operations management, maintenance management, radiation management, and radioactive waste management. The assessment evaluated those from the viewpoints of the setups for maintaining and improving safety and whether or not the improvements that have been made were appropriate. For each reactor evaluated the results of the assessment indicate that operational experience is reflected in all of the areas mentioned above, and that improvements for maintaining and increasing safety have been made to the facilities and equipment that are critical to safety.

The part of the assessment entitled "Reflection of Latest Technical Knowledge" states that the latest technical knowledge, i.e., the results of safety research; the lessons gained from both domestic and international operational experience, and the results of technology development, are independently reflected in the plants that were evaluated; that safety improvements have been made appropriately; and that improvements to a variety of equipment for the purpose of higher reliability are being planned.

ANRE plans to evaluate other plants, too, at a rate of three or four plants each year. After periodic safety reviews of the 46 light water reactors now in operation are completed in 10 years, ANRE will re-evaluate the plants every 10 years. This fiscal year the agency plans to conduct safety reviews on the Kansai Electric's Mihama NPP No. 2 reactor, Chugoku Electric's Shimane NPP No. 1 reactor, Tokyo Electric's Fukushima NPP-I No. 2 reactor, and Kyushu Electric's Genkai NPP No. 1 reactor.

Reactor Pressure Vessel for World's First ABWR Delivered

95FE0002F Tokyo DEMPA SHIMBUN in Japanese 29 Aug 94 p 7

[FBIS Translated Text] On 23 August Tokyo Electric Power Co. (TEPCO) brought in the reactor pressure vessel for the Kashiwazaki-Kariwa NPP No. 6 reactor (1,356,000 kW), which is now under construction.

The No. 6 reactor is the world's first advanced boiling water reactor (ABWR). The pressure vessel that was delivered is the most important piece of reactor equipment, and should be called the heart of the reactor. It took about two years and five months to make the pressure vessel. After some of the in-core structures were installed in the reactor pressure vessel, it was shipped over sea.

The pressure vessel weighs 120 tons (after actual installation, about 890 tons, excluding the cover and including fixed jigs) and is about 12 meters high. It is a large, heavy vessel with an inner diameter of 7.1 meters. The pressure vessel is 1.2 times heavier than the reactor pressure vessel of a 110,000-kW-class boiling-water-type light water reactor. Consequently, a special crane that can lift up to 1,000 tons was used to lift the pressure vessel. It was the heaviest single piece of equipment lifted by a crane in a Japanese nuclear power plant.

TEPCO's Kashiwazaki-Kariwa NPP No. 6 reactor is an ABWR that has been developed with the objective of utilizing the operational experience gained in Japan and abroad to improve upon the safety, reliability, and operability of conventional boiling water reactors. This is the first time that TEPCO has placed orders for the reactor pressure vessel, turbine, generator, and other such main power-generating equipment to an international joint venture consisting of Toshiba, Hitachi, and General Electric. Construction of the nuclear power plant has progressed smoothly since it started in September 1991. Commercial operation of the plant is slated to begin in February 1997.

The following is a summary of the Kashiwazaki-Kariwa NPP.

Site: Kashiwazaki City and Kariwa-mura in Niigata Prefecture.

Type of reactor: advanced boiling water reactor (enriched uranium, light-water moderated, light-water cooled).

Electrical output: 1,356,000 kW.

(Summary of Equipment)

Type of fuel: sintered uranium dioxide pellets, 872 fuel assemblies (amount of total core uranium loaded: about 152 tons)

Reactor pressure vessel: vertical-type cylindrical vessel (made of steel). Height: about 21 m, weight: about 900 tons, inner diameter: about 7.1 m.

Reactor containment vessel: pressure-suppressing containment system. Height: about 32 m, volume: about 7,400 m^3 (dry well space).

Turbine: tandem-compound six-flow exhaust reheat and regenerative condensate system.

Generator: horizontal-shaft, inner-cylinder-rotation, field three-phase synchronous system. Capacity: 1,540,000 KVA.

The total cost of building the No. 6 reactor will be ¥435 billion.

Joint Research on Carbon-60 Conducted by Okazaki National Research Institutes and Russia

94FE0937A Tokyo NIKKEI SANGYO SHIMBUN in Japanese 16 Aug 94 p 3

[FBIS Translated Text] C60, with 60 carbon atoms connected in the form of a soccer ball, is known to rotate one by one even in a crystal, but there being a close relationship between this rotating movement and the speed of movement of electrons in the crystal was found in the Japanese and Russian joint research at the Okazaki National Joint Research Institute Molecular Science Research Institute. When a single crystal of C60 is cooled, the rotation speed becomes 1/1000 at -13°C and at the same time the speed of the electron movement becomes 1.7 times faster. Results related to the understanding of the phenomena of superconductivity reported in C60 compounds are anticipated.

The research group of Professor Ariyoshi Maruyama of the Molecular Science Research Institute and Professor E. Frankevitch of the Russian Energy Chemical Physics Research Institute ascertained the phenomenon. The main research was performed while Professor Frankevitch visited Japan as the guest professor of molecular research. In observations up to now, it was seen that the C60 molecule rotating on its own axis in a single crystal rotates freely if over -13°C and below that, the rotation speed enters a 1/1000 limited rotation state.

When Professor Maruyama et al. measured the speed of the electrons flowing in the C60 crystal, they became aware of a large difference at the boundary of -13°C.

When the temperature is reduced below -13°, the electron movement speed abruptly becomes fast. Also, the movement speed is constant at temperatures higher or lower than this and the change occurs with this temperature as the boundary. Professor Maruyama et al. performed precise measurements and concluded that this special phenomenon is related to the C60 rotation.

Professor Maruyama himself directly measured the electric resistance and confirmed for the first time that C60 enters a superconductive state under uniform conditions. This professor said that this new discovery "is the clue for understanding the superconductive phenomena of C60."

Osaka University Discovers Method to Determine Mass of Neutrino

94FE0937B Tokyo NIHON KEIZAI SHIMBUN in Japanese 29 Aug 94 p 19

[FBIS Translated Text] Professor Hiroyoshi Ejiri et al. of the Osaka University Physics Department discovered an important lead for ascertaining the mass of the neutrino, a puzzling elementary particle the weight of which is not known. A common law not according to the type of the atomic nucleus was discovered for the phenomenon where the atomic nucleus releases a neutrino in a special process called "double beta disintegration." The mass of the neutrino is thought to be zero or very slight if at all, but this research brought out the possibility of precisely determining the upper limit of mass.

Double beta disintegration is the phenomenon in which a certain atomic nucleus releases electrons and neutrinos two by two at the same time and changes into another atomic nucleus. Before now, this was actually observed for three types of atomic nuclei such as molybdenum, but the values of the observation data varied greatly depending on the type of atomic nucleus and it was difficult to unify and explain the mechanism of disintegration.

Recently however, Professor Ejiri et al. observed the world's first double beta disintegration of the cadmium atomic nucleus with the experimental device "Elegant V" established 1000 meters underground in the town of Kamioka in Gifu Prefecture. When analyzed along with prior data, the common law came to the front. According to Professor Ejiri, the probability of the double beta disintegration occurring is equal to the value of adding a certain constant to the probability of usual beta disintegration (release of electrons and neutrinos one by one) occurring twice in a row. This constant appears to be common even for an atomic nucleus for which double beta disintegration has not yet been observed.

Thus, the way to a cohesive explanation of double beta disintegration was opened. When the probability of disintegration is understood, the upper limit to neutrino mass is determined. The neutrino is observed in nuclear fusion reactions occurring in the center of stars such as the sun and supernova explosions.

Mitsubishi Electric Corporation Develops New Compact Nb3Sn Superconducting Coil

94FE0937C Tokyo NIKKAN KOGYO SHIMBUN in Japanese 6 Aug 94 p 1

[FBIS Translated Text] Mitsubishi Electric (President Takashi Kitaoka) publicized the development of a "liquid helium cooled, medium-sized niobium 3 tin superconducting coil" as part of superconductive electronics research. Called the "world's first" (Mitsubishi Electric), this was developed for the superconductive energy storage device (SMES) for the system stabilizing experiment of the 500,000 volt power cable handled by Kansai Electric. Since the critical temperature for entering the superconductive state is high compared to the prior niobium titanium superconducting cable, it becomes possible to maintain the superconductive state even at a high temperature double that of before; it is anticipated that it will have a large influence on the system stabilization of super high voltage power cables of the 500,000 volt class or above and the miniaturization of the superconducting coil. In mid-August, it was delivered to Kansai Electric General Technical Research Institute; the full-scale pulse operation diagnostic test was performed jointly and practical application was expedited.

With the aim for the superconductive devices to serve somehow for the stabilization of the power system, Kansai Electric developed the SMES with the total of the accumulated energy of the superconducting coil of 2.4 megajules. Presently, the prepared facilities at 1.2 megajules are the input/output converter, three superconductive magnets with unit stored energy 400 kilojules, and the control device, in this plan performed on the largest scale in the country. The plan is for two of the superconductive magnets to use niobium titanium wire rods as the superconducting wire

rod, and the other one to use the niobium 3 tin superconducting wire rod achieved in this development. Mitsubishi Electric is responsible for the development of the niobium 3 tin superconductive wire rod.

While the niobium 3 tin wire is applied as a wire rod for the superconducting coil having internal heat generation in order for alternating operation like SMES, the deterioration of the superconductive characteristics with a slight distortion has been the subject of many years of technical development. While Mitsubishi Electric made a coil design with distortion not exceeding 0.3% from the design stage, a dedicated coil corrector able to control distortion was developed and attained. In experiments in this company, experiments with electricity applied at a rated current of 350 amperes to store 400 kilojules of energy in the superconducting coil in a state submerged in liquid helium were successfully performed using a chopper.

Also, electricity at 120 amperes was applied with part of the superconducting coil submerged in liquid helium, and after two hours, it was confirmed that it could operate without abnormalities even with the superconducting coil completely exposed from the liquid helium; it opens a major route to actual system stabilization.

STA To Propose Research Promotion Assistance Policy for ASCA

95FE0108A Tokyo NIHON KEIZAI SHIMBUN in Japanese 5 Nov 94 p 11

[FBIS Translated Text] The Science and Technology Agency (STA) will propose a new framework of support for research promotion in the Asian region at a ministerial-level meeting of the Asia Scientific Cooperation Association (ASCA) that will be held in Manila from the 14th. The STA wants Japan to play a leading role in stimulating the exchange of scientific and technological information and the fostering of researchers, and to raise the level of research in the nations and regions participating in ASCA. The goal is to tie that in with assistance in scientific and technological fields requested by the other nations.

Japan's two-pronged research assistance policy will involve the exchange of scientific and technological information and the fostering of researchers. The STA's representative at the ASCA ministerial-level meeting, S&T Parliamentary Vice-Minister Sekine, will announce the new policy to twenty-some participating nations and regions that include Korea, the Phillipines, Malaysia, and Singapore.

In connection with the exchange of scientific and technical information, the STA proposals will include establishing an expert group to promote information exchange, publishing Japan's research information on CD-ROMs (read-only memory using compact disks), and providing a translation service for scientific papers. Because the state of other nations' S&T databases and computer usage at research sites is not clear, the STA plans to set up a working group and decide on concrete measures within two years.

There are also plans to expand the "STA Fellowship System" for young researchers from other countries and to extend that program to the year 2000 so that 1,000 Asian researchers will be received in Japan. The STA will also hold yearly seminars on R&D management methods.

MITI, STA To Research Status of R&D Regulations

95FE0108B Tokyo NIHON KEIZAI SHIMBUN in Japanese 8 Oct 94 p 12

[FBIS Translated Text] MITI and the STA began studies that will closely examine government regulations affecting R&D activities. The actual state of R&D regulations is hardly understood. For 18 months MITI will investigate the state of R&D regulations in the U.S. and Europe, and after six months the STA will look at the state of R&D regulations in Japan. Regulations that impede R&D activities will be eased or abolished, and those that facilitate R&D activities will be actively employed as promotional measures.

The studies will be undertaken as a part of the basic studies on government S&T policy that are selected by the Council on Science and Technology (headed by Prime Minister Murayama). MITI will commission the Japan External Trade Organization (JETRO) with its study, and the STA will commission the Japan Society of Consultant Engineers. Both MITI and the STA plan to set up study groups that will include outside experts. Through interviews of researchers and questionnaire surveys of R&D organizations, MITI and the STA will gain an understanding of systems that affect S&T fields.

While avoiding overlaps with items of existing studies, the new studies will analyze systems that facilitate R&D and regulations that impede R&D. The Japan Society of Consultant Engineers is expected to compile its results by the spring of 1995, and JETRO by the spring of 1996.

The government is making progress in reducing the regulations and authorization items that have generated complaints from industry.

STA Reports on Status, Plan of Superconductive Materials Multi-Core Project

95FE0109A Tokyo NIKKEI SANGYO SHIMBUN in Japanese 24 Oct 94 p 5

[FBIS Translated Text] The Science and Technology Agency (STA) issued a report that incorporates plans for the second term of the "Superconductive Materials Multi-Core Project." Compiled by the project's promotional committee (chaired by S. Saito, director of the Society of Non-Traditional Technology), the report establishes the core organizations for each research area. Although the multi-core system of contact with outside researchers will be maintained as it has been thus far, the number of core organizations will be reduced from fifteen to six. In the new system, the emphasis of research efforts until FY99 will be on applications of superconductive technology.

The report first looks over the first term of the project, which started in FY88, and cites the following as examples of results that were achieved: the discovery of bismuth superconductors and the formation of those into coils, and the development of 42 hybrid superconducting magnets in which different types of superconductors were combined. The report points out the need for R&D efforts that cover basic research to the practical application of superconductors.

For that reason the second term of the project beginning in FY95 will involve a re-organization of the management system in which the priorities were theory and analysis, and a shift to a multifaceted system of promotion that covers everything from fundamentals to applications. In the second term of the project the STA will promote the development of a high-performance gigahertz-class NMR (nuclear magnetic resonance) device and an ultra-high-precision system that measures the brain's magnetic fields.

Eisai Co. To Reinforce Overseas R&D Employing Researchers in U.S., Europe

95FE0079A Tokyo NIHON KOGYO SHIMBUN in Japanese 16 Nov 94 p 1

[FBIS Translated Text] Eisai Co., will increase the number of researchers at its research bases in the U.S. and Europe. The company will augment R&D efforts outside of Japan in order to promote a tripolar worldwide system for its pharmaceutical enterprise and to solidify its foundation. There are plans to hire in both the U.S. and the U.K. ten new researchers, all of whom will have doctorate degrees in pharmacology. Cutting-edge ideas that differ from those conceived by Japanese researchers will be accepted, and the new researchers will develop highly original, useful new drugs.

Eisai's pharmaceutical enterprise is expanded and organically linked over three areas—Japan, the U.S., and Europe. In 1982 the company opened the Tsukuba Laboratory, which forms its Japanese R&D base. Then Eisai established the Boston Laboratory in Andover, Massachussetts in 1989 and the London Laboratory on the campus of London University in the U.K.

The Tsukuba Laboratory serves as the company's center for the development of new drugs and plays the main role in exploratory research and pre-clinical studies; the Boston Laboratory, basic research in primarily organic synthesis for the creation of new drugs; and the London Laboratory, molecular- and cellular-level physiological studies of disease states.

Eisai's researchers in London developed a drug called E5531 to treat blood poisoning. Clinical trials are being conducted in the U.S. and are slated to begin in Japan as well. Eisai expects E5531 to be a big drug that has a new mechanism.

There are now 40 employees at the Boston Laboratory and 20 employees at the London Laboratory; ten more researchers at each laboratory will increase those staffs to 50 and 30, respectively. The idea is to give prominence to conceptual and cultural differences and to hire non-Japanese researchers who have obtained doctorate degrees in their home countries.

MITI To Begin Joint Research on Fuel Cell Development with Australia

95FE0079B Tokyo DENKI SHIMBUN in Japanese 14 Nov 94 p 1

[FBIS Translated Text] MITI will begin joint research with Australia on solid-electrolyte fuel cells (SOFCs). A formal decision about the research cooperation will be made at the 17th Japan-Australia R&D Conference that will be held in Canberra from 17 November, and the first meeting of experts will be held next June.

Australia is pouring a great deal of effort into the development of SOFCs that can use the gas that results from coal gasification. Although there has been cooperation between Japan and Australia in areas such as coal development and the development of solar power systems, this will be the two countries' first joint research on fuel cells. In the future, Japanese and Australian researchers will conduct joint research, visit each others' research facilities, and hold conferences for the exchange of information.

The Japan-Australia R&D Conference, an annual conference that alternates between Japan and Australia has brought about cooperation in the construction and operation of a pilot lignite liquefication plant in Victoria, joint field tests of solar batteries, and research cooperation in fields such as coal investigations, coal preservation, and coal gasification.

At the upcoming conference, a formal decision will be made on cooperation in SOFC research; joint research on global environmental problems will be discussed, at the request of the Australians; and the Australian participants will be informed about the status of Japan's R&D efforts pertaining to global environmental themes. There is also the possibility that after next fiscal year Japan and Australia will cooperate in research in global environmental areas. In addition, information on the status of energy R&D efforts will be exchanged, and there will be joint studies and the exchange of information in connection with coal and solar energy.

From Japan, nine people will be sent the conference, including AIST Deputy Director-General of Technology Affairs M. Fukizawa and T. Imanaga, head of the AIST Research Administration Division. From Australia, the Primary Industries and Energy Ministry's Resources and Energy Bureau Chief Wiggins and Energy Planning and Fishing Bureau Chief Wix will attend the conference.

MHI To Provide Exhaust Gas Desulfurization Technology to Spain, South Korea

95FE0079C Tokyo NIKKAN KOGYO SHIMBUN in Japanese 5 Nov 94 p 1

[FBIS Translated Text] Mitsubishi Heavy Industries (Kentaro Aikawa, president) will provide exhaust gas desulfurization technology to Spain and South Korea. In the countries of Asia, Eastern Europe, and Southern Europe where there has been vigorous industrial expansion, an increase in the demand for desulfurization systems is anticipated. Thus, MHI will strengthen its international strategy by providing desulfurization systems for preventing air pollution and acid rain. In Spain, MHI will start providing technology within a year to Babcock and Wilcox Espania (BWE). In Korea, MHI is negotiating a partnership, and, if all goes well, will decide to provide desulfurization technology during the first half of 1995. MHI also aims to cultivate ZVU, a Czech company, as a mechanical equipment supply partner in Eastern Europe.

MHI is the leading maker of exhaust gas desulfurization systems and has delivered about 120 of those systems to customers in mainly advanced countries such as Japan, the U.S., and Western Europe. In addition to having recently delivered desulfurization systems to Chongqing and Huangdao in China, in 1993 MHI received orders for five systems from the Czech Republic and orders for two systems from Thailand. Orders from Asia's newly industrialized countries and Eastern Europe are increasing.

With BWE, a Spanish company that makes boilers, negotiations are nearing an end. For the time being MHI intends to have within the scope of the contract the areas in Spain

where there is serious air pollution resulting from coal combustion. As for Korea, MHI is negotiating with one company there, and the prospects are for a decision to be made about MHI's provision of desulfurization technology by as early as the first half of 1995. In addition, in the conditions set forth by the Czech Electric Power Agency when it placed an order for a desulfurization system, ZVU, a company that builds chemical plants, is in charge of construction and procurement of some of the equipment. In the future MHI plans to cultivate ZVU as a desulfurization equipment partner in Eastern Europe.

MHI is already providing the technology for exhaust gas desulfurization systems to the FL Smith Co., in Denmark, the Ansard and Shifa Co.'s in Italy, and the Huaneng International Power Development Co., in China. In addition to those, MHI is strengthening its connections with companies located in areas where environmental measures are overdue so that it can enter into detailed business negotiations later.

Japanese companies develop the highest class of exhaust gas desulfurization technology. In anticipation of market expansion in Asia, Eastern Europe, and Southern Europe, Japanese heavy machinery and engineering companies are taking the initiative. Just since the beginning of this year, Chiyoda Chemical Engineering and Construction tied up with Korea's Daewoo, and Kawasaki Heavy Industries provided technology to Italy's Fijia [transliterated] Co. Kawasaki Heavy Industries and JGC Corporation also tied up with partners in Eastern Europe, and Hitachi Zosen has entered into the development of simple desulfurization systems that it hopes to sell in Asia.

Kubota To Construct Sewage Treatment Pilot Plant with British Company

95FE0079D Tokyo NIKKAN KOGYO SHIMBUN in Japanese 8 Nov 94 p 7

[FBIS Translated Text]

[LONDON] Kubota (Y. Mitsui, president) entered into a contract with Wessex Water, a large British water company, to conduct joint research on a membrane-separation sewage treatment system. At the end of December the construction of a pilot plant that can process 80 tons of sewage per day will begin. The plant will be completed by spring 1995. Although Kubota provided the technology for the system to a major British engineering company in October 1993, this joint effort with Wessex Water is the first concrete project. Kubota also wants to unfold similar projects in France and Germany and expects to open up a European market in the strategic field of environment-related equipment.

The membrane-separation sewage treatment system that was independently developed by Kubota is a facility that employs 0.1mm-thick microporous polyethylene membranes in combination with the Activated Sludge Process. Because solid-liquid separation can be performed reliably by the film in a liquid, high-load operation is possible, and sewage containing high concentrations of substances such as urine can be processed directly.

In addition, the system can efficiently and simultaneously remove organic pollutants as well as nitrogen, phosphorus, and other salts that cause eutrophication. Furthermore, because the system does not require the use of a settling tank, advanced processing equipment, or a sludge concentration tank, the area taken up by the system can be reduced by 25% or more by employing a purification tank.

Japan is Kubota's main market for the system, the first of which was delivered in 1991. However, the prospects look good for Kubota's setup for supplying the system to other countries, which show a keen interest in it. In October 1993 Kubota provided the technology for the system to a major British engineering company, Davie International, and signed a contract to supply the heart of the system; Davie International is to commercialize the rest of the system. Kubota concluded a similar contract in June 1994 with Babang, a member of the Babcock Group in Germany, and now is negotiating with a French company.

Next, Kubota will begin joint research with Wessex Water on the assumption that Wessex Water will actually use and purchase the system. British water companies take care of everything from getting water from rivers, processing it, and processing sewage, to discharging water back to the rivers. Except for in Scotland, the water companies are becoming privatized. In the U.K. there are ten large water companies. Along with the increase in awareness of environmental problems, interest in environment-related equipment is rising, but because of the conservative nature of the British, the people are wary about the introduction of new facilities. Wessex Water appears to be dealing with the situation in a positive manner. It will bear half of the cost of the project and will build the pilot plant for joint research with Kubota. The assumption is that Wessex Water will introduce a full-scale system if the pilot plant shows good results.

Encouraged by the fact that the initial project items have actually started, Kubota will hold a one-day seminar on the sewage treatment system on 13 November for the other nine water companies. Kubota expects this to be an opportunity that will spur the expansion of environmental enterprises in the U.K., Germany, and France.

Toshiba Develops PHS Amplifier

Achievement of Compact Size

95P60073A Tokyo NIKKEI SANGYO SHIMBUN in Japanese 28 Nov 94 p 5

[FBIS Translated Text] Toshiba Corporation has developed a low-voltage drive amplifier for personal handy-phone systems (PHS) which is ⅓ the size of conventional amplifiers. The smallest drive amplifier in the industry, 0.06 cubic centimeters, was created through special work on the design of the amplifier integrated circuit (IC) and peripheral circuit. It will be useful not only for compact and low electricity consuming PHS, where it is expected to be commercialized in the fall of 1995, but also for data communications by installing the new amplifier in the portable terminals of the future. Toshiba hopes to commercialize their development in 2 years.

An IC amplifier, driven at the low voltage of 2.7 volts and a peripheral circuit were combined to make a new compact amplifier that measures 5.5 millimeters in width, 5.5 millimeters in depth, and 2 millimeters in height. It is made of low-cost materials and has a structure that effectively resists high temperatures and pressure. The design is suitable for mass production.

Circuit structure, including performance and distribution of the IC amplifier and the peripheral circuit, was optimized through the use of high precision simulation technology.

The device features the LGA mounting method which draws outgoing wiring on the wrong side of the substrate. The peripheral circuit was simplified into a structure composed of 6 parts, limiting the mounting area to ⅓ that of conventional amplifiers.

An MESFET (metal-semiconductor field effect transistor) was used for the IC, which reduced distortion and increased signal amplification efficiency. Also production process yield was increased by using heat resistant tungsten nitride with the pressure resistant structure.

Developers have been working to create compact circuit parts for a long time since light weight and low electricity consumption terminals are crucial for wide acceptance of PHS.

JDA To Convert Air-to-Air Missile to Ship-to-Air Application

Aiming at Mass Production

95P60072A Tokyo NIHON KEIZAI SHIMBUN in Japanese 19 Dec 94 p 11

[FBIS Translated Text] Mitsubishi Electric Corporation (MELCO) and the Japan Defense Agency (JDA) have begun preparations to convert the Japanese air-to-air missile, a prototype of which will go into production in FY94, to a ship-to-air missile configuration in order to reduce costs through mass-production. Japanese missiles cost more to produce than foreign made missiles. The industry also intends to keep its production lines as close to full operation as possible during the period of defense budget reduction. Major weapons systems aboard ships used to be either imported or produced under foreign license. Similar missile development also is under way in the U.S., and bitter bilateral competition may develop.

JDA before the end of 1994 will name MELCO as the prime contractor to develop an air-to-air "XAAM4" missile which is intended to replace the currently available "Sparrow." The "XAAM4" is a radiowave guidance missile capable of emitting electromagnetic waves. If mass-produced, over 1,000 missiles are expected to be made. Meanwhile, the Hughes Corporation and Raytheon Company in the U.S. are trying to sell a similar "AMRAAM" missile. Therefore, it is crucial that Japanese costs of production be reduced to be able to supply the Japanese missiles to the JDA. According to JDA officials, "competition is out of the question unless costs drop below 100 million yen per unit."

Thus, cost-cutting efforts include conversion of the air-to-air missile to ship-to-air configuration, and to increase the number of units made through mass-production, reducing the price per missile. Furthermore, approximately 500 to 1,000 ship-to-air missiles are expected to be ordered. JDA included 600 million yen for the conversion research in their FY95 budget proposal. MELCO will also be in charge of the research. It will take about four years before a prototype will be produced.

JDA's major ship-to-air missiles used to be all foreign made. MELCO has been producing the currently available "Sea Sparrow" under license from Raytheon. Development of advanced ship-to-air missiles has already begun in the U.S., and therefore Japan may very well face American pressure as with air-to-air missiles in the past to buy their advanced ship-to-air missiles. Also there are calls within JDA for Japan to use U.S.-made missiles to assure mutual operability with the U.S. military.

Since Japan is prohibited from exporting weapons under the Three Principles of Arms Exports, defense equipment has been made in small quantities by Japanese manufacturers, and this tends to increase the cost of domestically produced weapons when compared to foreign made products.

Research Center Chief Examines Meaning of Restructuring

OW0612080594 Tokyo BOEI GIJUTSU JANARU in Japanese Nov 94 pp 2-3

[Commentary by Sokumichi Arizono, chief of the Defense Agency Technical Research and Development Institute 1st Research Center]

[FBIS Translated Text] Recently, we often come across the word "restru" (restructuring), but just what does it mean? As commonly used, it is the restructuring of organizations and systems, that is, abandoning old systems and trying something new. The result is discarding that which does not fit the times and opening up new fields for which there are future expectations. Or, in employment terms, it can be seen as trying to respond to severe changes in an environment by reforming the seniority system by changing to a system valuing ability.

However, as for what to do, people determine everything. Clearly, one cannot achieve one's goals simply by reforming organizations and systems. In moving to implement any new attempts whatsoever, reforming people's own understanding—that is, self-restructuring—is indispensable.

In today's harsh era of change, there often arise problems that are unforeseen and for which there are no precedents. Not simply existing concepts but creative new ideas and the effort to realize them are required to respond to such problems. Sticking to outdated rules and holding on to them results in not a single new thing. Indeed, it is by occasionally breaking with precedents that new roads are opened. Today's time of harsh change is one in which, whether or not existing thinking is still valid, its appropriateness is questioned. This is a time requiring both a spirit of challenge to escape from the existing framework of safe thinking as well as strong determination. The spirit of adventure does not come from people satisfied with present conditions. "Self-restructuring" can be achieved in a process of pursuing new changes by casting off old skin and recognizing current problems.

So, what parts of the old skin should be shed, and how should we do it? "Humans are creatures of experience," as the saying goes. We have a strong disposition generally for things that we have experienced ourselves. We are unable easily to bring ourselves to abandon things that we know we should. In the wake of the Cold War, the world situation has greatly changed. As we grope for the future, I think it is necessary in regard to our equipment research and development (R&D) that we shift from R&D imitating U.S. and European models to R&D that values the fostering of our own technology. The times call for superior technology; possessing superior technology is the key to deterring war. However, because R&D of original technology involves many technical risks, it is often the case that, due to the unease of those involved regarding original technology and their ease with existing ways of doing things, achieving original technology does not proceed smoothly. This could be one form of "adherence" to precedent. This "adherence" is part of human nature. Unease towards things never before experienced and ease with what is already known entwine in a complicated manner.

However, if this "adherence" is not abandoned, true change cannot emerge and one cannot expect new results. "Self-restructuring" is, thus, the need to begin by abandoning this "adherence." People think self-indulgently, in many cases going too far before they realize it and making wrong decisions. But without denigrating themselves or having too much confidence, it would be simple for them to realize their own mistakes and abandon their "adherence" by cooling revising the way they view themselves.

"Self-restructuring" is endless self-criticism. Needed is an effort towards a detachment born of vigorous self-examination. First, one has to have the courage for reform. Then one advances in the midst of difficulties and with endurance towards one's own vision without excess and without slackening. People who have gone to the limit are probably those carrying out "self-restructuring" unconsciously. Achieving self-change before realizing it can be considered the most desirable way.

Everyone has the desire to grow and move ahead, even if only a little. Everyone also approaches this goal unconsciously. One can restructure oneself before realizing it by approaching matters consciously, confidently, and with self-criticism. Those who succeed in "self-restructuring" can be the most appropriate people to carry out restructuring in the common sense of the word.

Japan: Article Introduces TRDI Research Center Missile Simulator

OW0612080394 Tokyo BOEI GIJUTSU JANARU in Japanese Nov 94 p 39

[Article by Masataka Chiba of the Defense Agency Technology Research and Development Institute (TRDI) 3rd Research Center 3rd Department 1st Guided Missiles Laboratory]

[FBIS Translated Text] There are presently two simulators for missile R&D [research and development] at the TRDI's 3rd Research Center. One is called the "missile simulator." Another is called the "precision guided missile simulator." The missile simulator introduced in this article is for showing a target indoors in the pole coordinate format with definite distances. This is used mainly for wave guidance and simulation testing of point-target infrared guidance systems.

This missile simulator, our nation's first substantial simulator for missiles, was test-manufactured in fiscal year 1975. As the graphic [not pictured] shows, the simulator consists of a gimbal mechanism of five axes—three for the missiles and two for the targets—a hybrid computer, and a control loading device. Since its completion, it has been used in simulation tests for such missiles as the Type 80 air-to-ship guided missile and the Type 88 ground-to-ship guided missile, greatly contributing to their development. Also, our nation developed missile simulation techniques through the test-manufacturing and operation of this simulator, which has had a great influence on each subsequent simulator.

Thereafter, with the upgraded functions and capabilities of missiles developed in Japan, there has been a growing need for missile performance evaluation for complex electronic wave environments and independent, multiple targets. From fiscal year 1989 to fiscal year 1991, there was added an array antenna using approximately 400 horn antenna to show multiple electronic wave targets and backgrounds. Its effectiveness was proven in simulation tests for wave-guided air-to-air guided missiles, short-range ground-to-air guided missiles, and others. Approximately 15 years have passed since the first test-manufacturing, and its performance as missile simulation testing equipment has been greatly upgraded.

With increasingly sophisticated functions and performance of domestically developed missiles foreseen, it is thought that simulation testing in missile testing and evaluation will play a greater role. In particular, simulation testing will become inevitable for evaluating missiles in cases where field launch tests are difficult in Japan, such as in evaluating guidance control performance for long-range missiles, attack performance against small-scale targets entering at low altitude in a complex electronic wave environment, or effectiveness against high-speed targets entering at high altitude.

Also, as missile systems themselves become increasingly large-scale, it is easy to predict an increasing need for performance evaluation not only for the missiles themselves but for the entire missile systems. I think that upgraded testing equipment and improved simulation technology will be required.

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